

Development of an automobile thermoelectric generator design for buses and trucks: An economical study for decreasing the costs

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Abstract

In order to improve the performance of trucks and buses during winter and prolong the life of engines, the authors proposed a thermal electric generator that generates and uses the heat of the diesel combustion products of an independent heater for a passenger compartment of a bus or a truck and generates electrical energy capable to provide its own consumption completely. The difference from other developments is the absence of a liquid circuit and, as the consequence, low requirements for tightness. The feature of the proposed TEG is the use of air as a cold heat carrier for the combustion in TEG combustion chamber, and the combustion products of diesel fuel as a hot heat carrier. Having carried out the engineering calculation for the maximum capacity of an autonomous interior heater, the geometric dimensions of the central channel were set, which made 40x40 mm, and a three-dimensional model of the layout solution was developed. In this paper, the authors developed the design of a thermal-electric generator (TEG). Besides, full-size calculation domains were constructed and numerical modeling of TEG operation was performed for various operating modes of an air heater. The values of the temperature fields on the external and internal surfaces of TEG were obtained and the heat fluxes were determined transferred from cold and hot heat carriers.

Keywords

Decreasing the costs, Economical study, Engineering, Flow structure, Heat transfer, Modeling, Simulation, TEG, Thermal-electric generator, Turbulence flow

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